SCIENCE UPDATE

Sustainable Corn Production Supports Advanced Biofuel Feedstocks

Researchers have found a cost-effective, energy-efficient, and environmentally sustainable method to use corn stover for generating an energy-rich oil called "bio-oil" and for making biochar to enrich soils and sequester carbon. The team used fast pyrolysis to transform corn stover and cobs into bio-oil and biochar. They found that the bio-oil captured 70 percent of the total energy input, and the energy density of the bio-oil was 5 to 16 times that of the feedstock. This suggests it could be more cost effective to produce bio-oil through a distributed network of small pyrolyzers and then transport the crude bio-oil to central refining plants to make "green gasoline" or "green diesel," rather than transporting bulky stover to a large centralized cellulosic ethanol plant. About 18 percent of the feedstock was also converted into biochar, which contains most of the mineral nutrients in the corn residues. Amending soils with this biochar would return those nutrients to the soil, reduce leaching of other nutrients, help build soil organic matter, and sequester carbon. *Charles Mullen, USDA-ARS Crop Conversion Science and Engineering Research Unit, Wyndmoor, Pennsylvania; (215) 836-6916, charles.mullen@ars.usda.gov.*

Plant Hormone Increases Cotton Yields in Drought Conditions

A naturally occurring class of plant hormones called "cytokinins" has been found to boost yields from cotton crops that receive little or no irrigation during drought conditions. Young cotton seedlings have difficulty reaching available soil water because they have small root systems. By tricking water-stress defenses in the young plants, cytokinins prompt the plant to quickly build a bigger root system that can access deep soil moisture. They also stimulate the growth of a protective wax on the surface of the plant that helps reduce water loss. Test results indicated that one application of cytokinins produced a 5- to 10-percent increase in yields under water-reduced conditions. In addition, the hormones didn't help or hinder yields under fully irrigated or rainy conditions, which makes them safe to use in all weather environments. There is also no extra work involved for the grower, because cytokinins can be applied when conducting normal weed-management practices early in the season. *John Burke, USDA-ARS Cropping Systems Research Laboratory, Lubbock, Texas; (806) 749-5560, ext. 5216, john.burke@ars.usda.gov.*

Fungi May Hold Key to Reducing Grapefruit Juice Interactions with Medications

Grapefruit juice can interfere with the effectiveness of some medications because it contains furanocomarins, which are one of many types of phytochemicals commonly found in plants. Furanocomarins inhibit the enzymatic activities responsible for metabolizing certain medications and facilitating their release into the bloodstream. Researchers have found that the fungus *Aspergillus niger* either binds with grapefruit furanocomarins or enzymatically breaks them down. Studies are continuing to identify the enzymes in *A. niger* that prompt the breakdown of furanocomarins to see if these enzymes could be used to eliminate the compounds from grapefruit juice.

In another study, when edible mushrooms that are related to *A. niger*—including morels and oyster and button mushrooms—were dried, pulverized, and added to grapefruit juice, they also removed furanocomarins. These findings provide additional evidence that proteins from *A. niger* and other fungi might someday lead to new methods for removing furanocomarins from grapefruit juice. *Jan Narciso, USDA-ARS Citrus and Subtropical Products Laboratory, Winter Haven, Florida; (863) 293-4133, ext. 119, jan.narciso@ars.usda.gov.*

Tough New Spuds Take on Double Trouble

Powdery scab and black dot can cause yield losses of up to 25 percent in potato crops and prevent tubers from reaching the sizes needed by the French-fry and fast-food industries. Now, five new potato breeding lines could lead to development of cultivars that are resistant to the fungal pathogens that cause both diseases. After screening a collection of wild and cultivated potatoes for sources of natural resistance to powdery scab and black dot, researchers developed the five advanced potato breeding lines from a wild species from Mexico, *Solanum hougasii,* and a recent commercial release, Summit Russet. In 3 years of field trials, the potato breeding lines consistently showed fewer disease symptoms—root galling for powdery scab and sclerotia-infected stems for black dot—than other lines and varieties tested. These new lines will be made available as seed for potato breeding programs working to develop the first commercial varieties with dual resistance to the fungal diseases. *Chuck Brown, USDA-ARS Vegetable and Forage Crops Research Laboratory, Prosser, Washington; (509) 786-9252, chuck.brown@ars.usda.gov.*